Cleaner, Safer Air

Ashforth's Commitment to Improving Indoor Air Quality

Indoor Air Quality Study

Needlepoint Bipolar Ionization

The Ashforth Company

A Long-Standing Commitment

The Ashforth Company has a long-standing commitment to improving indoor air quality.

Since 2015 when The Ashforth Company installed its first needlepoint bipolar ionization air cleaning system, the company has learned firsthand how **ionization helps improve indoor air quality by reducing the number of airborne particles.**

In 2019, prior to the COVID-19 pandemic, Ashforth began looking into upgrading its system based on its excellent results to date. In 2020 **Ashforth partnered with ENCON Heating & Air Conditioning and Global Plasma Solutions (GPS)** to increase the output of its system by 5X and to install the new system in two other office buildings.

The GPS Needlepoint Bipolar Ionization (NPBI™) system consistently ranks as a leading technology for pathogen mitigation and provides greater protection against volatile organic compounds, allergens, and other airborne bacteria and viruses.

The Challenge

Ashforth's challenge? Address the IAQ of our buildings as part of a comprehensive COVID-19 risk mitigation strategy.

In addition to other safety protocols – including masks and social distancing – our plan included a significant upgrade of the existing ionization system at our **Greenwich Plaza** buildings and installation of ionization technology in two of our other office buildings – **3001 Stamford Square** and **707 Summer Street**.

The goal was to find a third-party-validated, air-cleaning solution that would not only help improve overall IAQ but also address certain viruses and bacteria, including SARS-CoV-2 (and its future variants), the virus that causes COVID-19. We also wanted to ensure that the technology chosen was UL 2998-certified and scientifically proven to not produce harmful levels of ozone or other by-products.

"We're committed to adapting as circumstances change, so we continue to look for the best IAQ solution for our tenants, employees, and visitors."

H. Darrell Harvey
Co-Chief Executive Officer
The Ashforth Company

The Solution

Global Plasma Solutions® (GPS®) and Ashforth's HVAC contractor, **ENCON Heating and Air Conditioning,** recommended an advanced solution to help improve IAQ: an upgraded and more powerful version of GPS's patented NPBI™ technology.

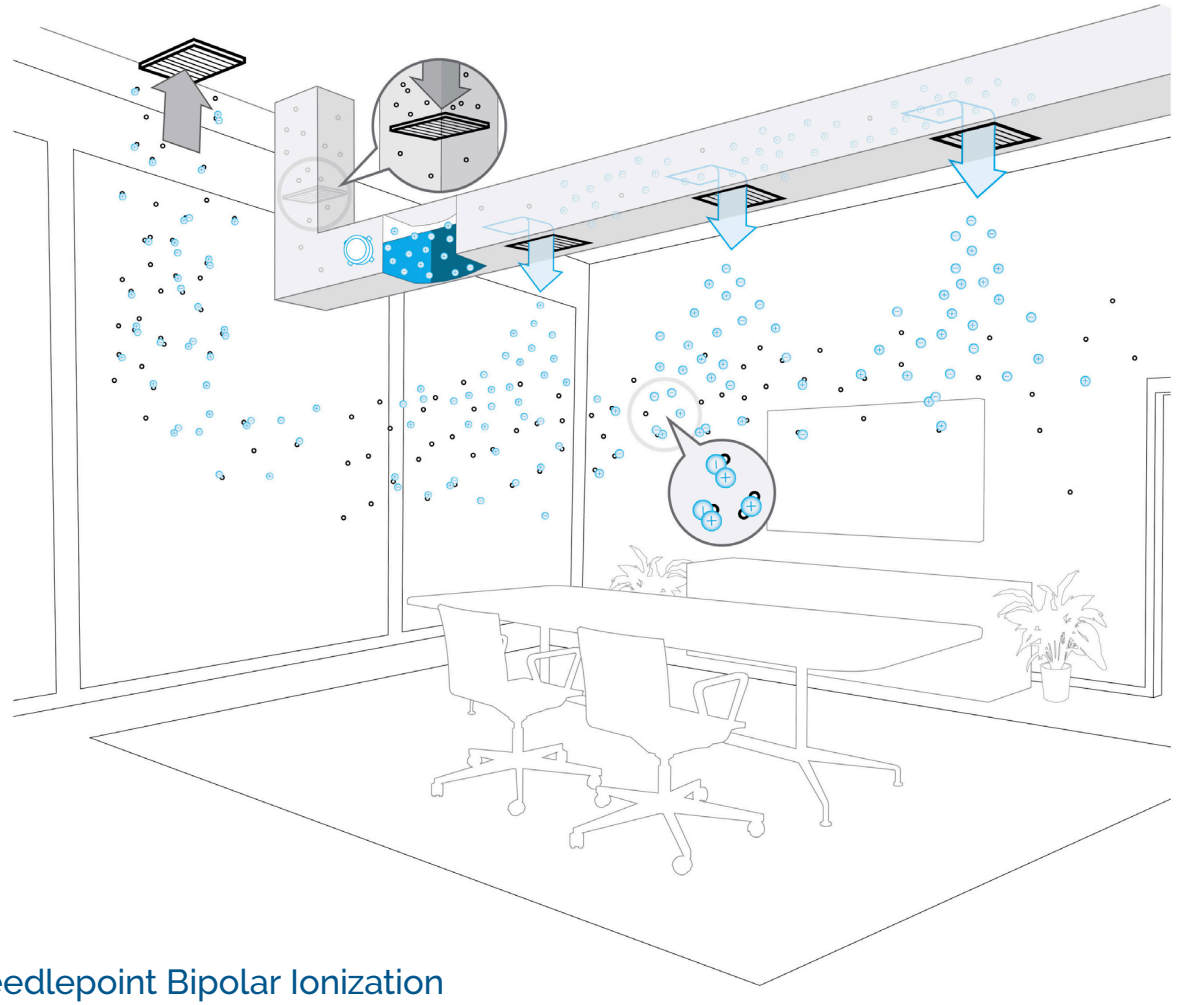
After conducting its own research, Ashforth agreed that this upgraded NPBI system was the best air-cleaning choice. Ashforth was particularly drawn to this new system based on its robust third-party data that showed the technology's high ion output and efficacy in removing and/or inactivating viral particles, including SARS-CoV-2 and, potentially, its future variants.

Our building-wide systems **continuously purify** the **indoor air** to help **mitigate** disease-causing viruses including COVID-19, plus bacteria, mold, VOCs, allergens, dust, and odors.

Reduces Pathogens

Targets Particles

Tackles Odors



Needlepoint Bipolar Ionization

A Proactive Approach to Cleaner Air

NPBI generates and releases ions into the existing HVAC system's airstream. Through a ***process called agglomeration,*** *the ions attach to particles, including certain viruses and bacteria, thereby increasing the size of the particles. The HVAC filter can then trap and remove the resulting larger clusters from the air more easily and consistently. Ions produced and released by NPBI also have the ability to disrupt the surface proteins of certain viruses (including SARS-CoV-2 and potential future variants) and bacteria, rendering them immediately inactive.* ***NPBI is UL-certified not to produce harmful ozone.*** *It also requires no replacement parts and little to no ongoing maintenance. Installation is simple and usually completed within a matter of days.*

Product Selection

Several factors informed the specific GPS products chosen for and installed in each of our three Connecticut office buildings.

Product Selections Depend on:

- **The Size of the Space**
  How much air needs to be cleaned in different areas of the office
- **The Office Layout**
  Which determines how air flows to all rooms
- **The Type of HVAC Equipment in Use**
  For mounting compatibility
- **The Ionization Produced by Each GPS Product**
  How many ions each product generates

ENCON Heating & AC
Building Efficiency and Sustainability
A Service Logic Company
GPS

NPBI™: Cleaner Indoor Air Made Simple

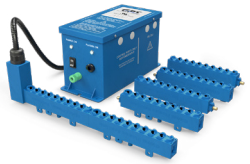
- Easy installation
- Minimal ongoing maintenance and less filter changes
- No need for replacement parts
- Energy saving opportunities
- GPS NPBI is UL 2998 and UL 867-20070 certified technology generates ions without producing ozone or other harmful byproducts

Greenwich Plaza

Building Type: Two separate office buildings with **central air systems.**

Building Size: 324,000 sq. ft.

Two GPS products replaced the existing ionization rails that were installed in 2015, increasing the number of ions being produced **fivefold.**



- **GPS-iMOD®:** The GPS-iMOD was the primary air ionization system selected for Greenwich Plaza. One GPS-iMOD unit was installed in each of the two Greenwich Plaza buildings based on coil size. The coils in Building 1 are slightly larger, making the 90-inch iMOD the perfect choice. The 78-inch GPS-iMOD was selected for Building 2.

- **GPS-DM48™-AC:** The lobby air handling units run independently from the primary HVAC system, so this duct-mounted, auto-cleaning ionization system was installed to deliver ions to the lobby of each building.

3001 Stamford Square

Building Type: Office building with a **heat pump system.**

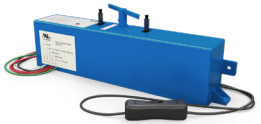
Building Size: 300,000 sq. ft.

- The auto-cleaning **GPS-FC48™-AC** was selected for its flexible mounting capabilities and size, which allows it to provide optimal ion production for the volume of air passing through the space.

707 Summer Street

Building Type: Office building with a **heat pump system.**

Building Size: 74,000 sq. ft.



- The auto-cleaning **GPS-FC48™-AC** was the primary ionization system installed in the building

- The **GPS-DM48™-AC** was also installed in the ductwork approximately 15 feet before the diffuser for one of two nearby conference rooms. This helped determine the effect of additional ionization on average ion levels in two otherwise identical rooms that share the same HVAC and primary NPBI system. The GPS-DM48-AC has multiple mounting options that allow for installation in the unique duct run to one of the conference rooms, making it the best choice for an ion boost.

Methodology & Results

Particle Count Reduction Between Outdoor & Indoor Air

Greenwich Plaza — central air system

particle count (≥0.3 microns)

Outdoors	13,338	
Indoors: **NPBI + MERV 16**	900	**93% Reduction** using NPBI + MERV 16 filtration

3001 STAMFORD SQUARE — heat pump system

Day 1: Outdoors	4,948	
Indoors: MERV 13	3,034	**39% Reduction** using MERV 13 filtration only (no NPBI)
Day 2: Outdoors	6,077	
Indoors: NPBI + MERV 13	1,766	**71% Reduction** using NPBI + MERV 13 filtration
Indoors: **NPBI + MERV 16**	318	**95% Reduction** using NPBI + MERV 16 filtration

707 SUMMER — heat pump system

Day 1: Outdoors	8,381	
Indoors: NPBI + MERV 13	1,615	**81% Reduction** using NPBI + MERV 13 filtration
Day 2: Outdoors	8,262	
Indoors: **NPBI + MERV 16**	427	**95% Reduction** using NPBI + MERV 16 filtration

Further Reduction in Particle Count with Additional Conference Room Ionizer

Conference Room — heat pump system

NPBI + MERV 16	654	
NPBI + MERV 16 ***w/ Extra Ionizer***	240	**63% Further Reduction**

in particle levels between two nearby conference rooms – one with an extra ionizer mounted in a supply duct close to the room vs. a comparable conference room across the hall with just the building ionizer system – indicated that the added ionization further reduced the level of airborne particles.

NPBI combined with higher levels of filtration provides the cleanest air

The ENCON and Ashforth teams started collecting data in the fall of 2020 using an Extech VPC300 particle counter (shown at right). Measurements of particle levels (0.3 microns per cubic centimeter or greater) were taken in various locations within the office buildings under varying conditions (e.g., with NPBI™ products switched on or off and with different levels of filtration). Outside measurements were also collected for comparison purposes, making the relative particle counts on each day most important since the starting particle levels of the outside air varied each day of testing. ENCON collected initial measurements, but the Ashforth team handled the majority of data collection, which has also been reviewed by GPS, the manufacturer of the ionizers.

Key Findings

Our field study yielded impressive results that underscore the significant impact a proactive air-cleaning approach can have on overall IAQ. Data collected consistently demonstrate that NPBI™ reduced overall indoor airborne particle levels, especially when paired with enhanced filtration and/or an ion booster.

In this case, recorded particle counts – up to 94% lower than outdoor levels – are particularly salient for two reasons:

- The SARS-CoV-2 virus is a particle. As total indoor airborne particle levels are reduced, the total number of viral particles are also reduced.
- Common environmental contaminants require ongoing mitigation for optimal IAQ, making the use of third-party-validated technologies – such as NPBI – all the more critical moving forward.

"Our goal was to improve IAQ in our buildings to the highest possible level and to install an air-cleaning technology that not only reduced airborne particles but also was effective against a range of airborne viruses and bacteria. Even after the pandemic is over, NPBI will help ensure that we have cleaner air in our office buildings."

H. Darrell Harvey
Co-Chief Executive Officer
The Ashforth Company

Key Findings Include:

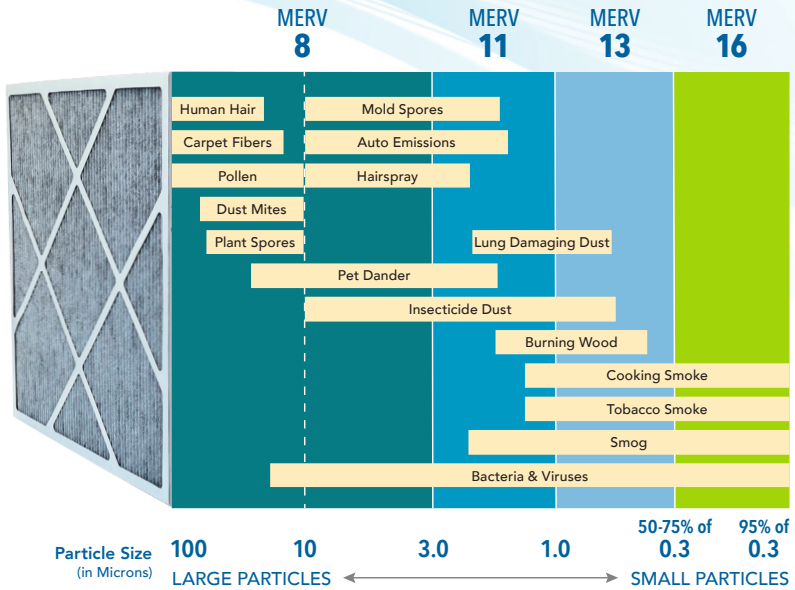
- Average indoor airborne particle levels in office buildings with NPBI technology were **noticeably and consistently lower** than particle levels measured outdoors.
- **NPBI technology has been proven to enhance filtration and enables higher level filters to be installed,** resulting in further reduction of particle levels.
- Results for a conference room with **an additional ion booster showed 63% fewer particles** than a nearby conference room without an ion booster, indicating that **added ionization further reduces the level of airborne particles.**

Glossary

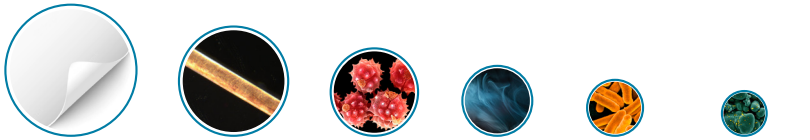
Ions – a type of an atom with an unequal number of electrons and protons. When it loses electrons it acquires a positive charge, and if it gains electrons it acquires a negative charge. A typical outdoor environment has 100 to 1,000 ions (both + and -) per cubic centimeter (cc or cm^3). Positive and negative ions created at the same time will last up to about 60 seconds after being created and dispersed in a building before they attach to other particles.

MERV – *Minimum Efficiency Reporting Value* is a scale developed by the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) to measure the effectiveness of air filters. The scale is from 1 to 20, where 20 in the highest rating. A MERV 17-20 rating is considered a HEPA filter. **MERV 16 Filters** – either charcoal or non-charcoal (Ashforth prefers non-charcoal); and either two-inch or four-inch (Ashforth prefers four-inch for better air flow and to reduce chance of freezing coils).

Higher MERV Ratings Capture Smaller Particles



Comparison of Micron-Sized Particles



Micron (µm) – A micron, or a micrometer, is equal to 1 x 10^{-6} meters, or, one millionth of a meter; or one twenty-five thousandth of an inch. **A human hair is between 17-181 microns in diameter with an average of 75 microns.**

NPBI – *Needlepoint Bipolar Ionization* is a process in which electro-static repulsion causes electrons to emit from a needle producing both negatively and positively charged ions in the air, a plasma field filled with a high concentration of + and - ions. As these ions travel in the air they attach to particles, pathogens, and gas molecules. **The ions help to agglomerate fine sub-micron particles, making them filterable or fall to the ground.** The ions kill pathogens by robbing them of life-sustaining hydrogen. The ions breakdown certain harmful VOCs into harmless compounds.

Ozone – A highly reactive gas, which in the stratosphere is good as a protector against radiation from the sun, but at ground level is toxic and can cause respiratory issues and damage to the lungs. Ozone was found to be produced by early ionizers. Further study by Ashforth of the positions taken by the EPA and the FDA on the new ionizers, and the UL certifications (UL 2998 and UL 867-20070) of the NPBI system installed by Ashforth, certifying it in effect to be "ozone free" (below 0.005 parts per million ("ppm") versus a required minimum of 0.5 ppm), confirmed that the **GPS NPBI technology generates ions without producing ozone or other harmful byproducts.** Furthermore, as an additional precaution, after the installation of the new ionization system, Ashforth obtained a confirmatory report from an independent hygienist based on readings taken specifically in the building, which were consistent with the conclusions reached by UL, and indicated ozone levels of less than 0.023 ppm.

Particle – An atom, molecule or ion.

$PM_{0.3}$ – Particulate Matter 0.3 microns in size. Particulate matter between 0.1 and 0.3 microns is the most difficult size particle to remove from the air with filters. Particle sizes larger than 0.3 microns are more easily caught in a filter as are the smallest ones as a result of Brownian Motion.

Viruses – Particulate range is 0.04 - 0.3 microns in size. The average diameter of a Corona Virus Particle is 0.125 microns.

The Ashforth Company

Operating Principles

Commitment

Enduring business relationships will enhance the value of our company.

Quality

We are dedicated to providing the highest level of service with speed and professionalism.

People

We foster teamwork, personal growth, creativity, and leadership. We encourage respect for the individual, communication, optimism, and a sense of humor.

Practices

We act with integrity and fairness with our customers, employees, and community.